CLAIMS

WHAT IS CLAIMED IS:

1) A fastener retention system comprising

a fastener having a first end and a second end, said first end being adapted to fixedly engage a first body, and said second end being adapted to engage a second body; and

a resilient retention member cooperating with said second body and said second end of said fastener such that said fastener may be selectively changed between a non-retained condition and a retained condition, with respect to said second body, when said retention member is changed between a relaxed state and a flexed state, in order to join said first body and said second body.

2) A retention system according to claim 1 wherein

said first end of said fastener comprises screw threads.

3) A retention system according to claim 1 wherein

said first body comprises bone; and

said second body comprises a surgically implantable device.

4) A retention system according to claim 3 wherein

said fastener is a bone screw.

5) A retention system according to claim 3 wherein

said surgically implantable device is adapted to span between at least two bone structures.

6) A retention system according to claim 5 wherein

said surgically implantable device is a plate that is fastened to each of said at least two bone structures.

7) A retention system according to claim 1 wherein

said retention member is a split ring.

8) A retention system according to claim 7 wherein

said split ring has a first diameter when it is in a relaxed state, and is adapted to resiliently expand to larger diameters when it is in a flexed state;

said second end of said fastener comprises a locking portion of said fastener having a large diameter section greater than said first diameter and positioned between two smaller diameter sections; and

said split ring is positioned within said second body such that said fastener is retained in said second body when said split ring is positioned around one of said smaller diameter sections in a manner in which said large diameter section must be passed through said split ring in order to remove said fastener.

9) A retention system according to claim 8, wherein

said second end of said fastener is threaded.

10) A retention system according to claim 8, wherein

said second end of said fastener is generally spherical and is threaded over a portion including said large diameter section.

11) A retention system according to claim 8, wherein

said second body comprises an opening in which said split ring is positioned, said opening having a surface diameter at the outer surface of said second body and a sub-surface diameter beneath said outer surface that is greater than said surface diameter.

12) A retention system according to claim 11, wherein

said split ring has an outer diameter in its relaxed state that is greater than said surface diameter.

13) A system for joining a first body to a second body, said system comprising

a fastener comprising an elongated shaft of varying diameter along a longitudinal axis; and

a resilient member adapted to be selectively positioned around said fastener and sized such that said resilient member is in an un-stressed state at various positions along

said longitudinal axis, and said resilient member is in a stressed state in at least one position along said longitudinal axis;

wherein a first portion of said shaft is adapted to fixedly engage a first body, and a second portion of said shaft is adapted to engage a second body and be retained with respect to said second body when said resilient member is positioned around said fastener in a position adjacent to said at least one position in which said resilient member is in a flexed state.

14) A system according to claim 13, wherein

said first body is bone and said second body is a surgically implantable device.

15) A system according to claim 13, wherein

said resilient member is a split-ring spring that surrounds said shaft.

16) A bone screw system adapted to fasten a surgically implantable device to a bone, said bone screw comprising

a head having a proximal end of a first diameter, a middle portion of a second diameter, and a distal end of a third diameter, said second diameter being greater than said first and third diameters;

a shaft extending from the distal end of said head and being adapted to be fixedly retained in said bone;

a resilient retention member adapted to fit around said head in a manner in which said retention member is flexed when positioned around said second diameter, but said retention member is un-flexed when positioned around said third diameter; and

a receiving opening in said surgically implantable device sized to prevent removal of said head and said retention member from therein when said retention member is positioned around said first diameter.

17) A system according to claim 16, wherein

said head is threaded.

18) A system according to claim 16, wherein

said head is threaded over said middle portion.

19) A method of retaining a fastener, said method comprising

providing a fastener having a first end and a second end, said first end being adapted to fixedly engage a first body, and said second end being adapted to engage a second body;

providing a resilient retention member that cooperates with said second body and said second end of said fastener such that said fastener may be selectively changed between a non-retained condition and a retained condition, with respect to said second body, when said retention member is changed between a relaxed state and a flexed state, in order to join said first body and said second body;

positioning said retention member in said second body;

positioning said first body and said second body in close proximity to each other;

passing said fastener through said second body and into said first body such that said fastener is retained in said first body; and

moving said retention member between a relaxed state and a flexed state in order to retain said fastener to said second body.

20) A method according to claim 19 wherein

said first end of said fastener comprises screw threads.

21) A method according to claim 19 wherein

said first body comprises bone; and

said second body comprises a surgically implantable device.

22) A method according to claim 21 wherein

said fastener is a bone screw.

23) A method according to claim 21 wherein

said surgically implantable device is adapted to span between at least two bone structures.

24) A method according to claim 23 wherein

said surgically implantable device is a plate that is fastened to each of said at least two bone structures.

25) A method according to claim 19 wherein

said retention member is a split ring.

26) A method according to claim 25 wherein

said split ring has a first diameter when it is in a relaxed state, and is adapted to resiliently expand to larger diameters when it is in a flexed state;

said second end of said fastener comprises a locking portion of said fastener having a large diameter section greater than said first diameter and positioned between two smaller diameter sections; and

said split ring is positioned within said second body such that said fastener is retained in said second body when said split ring is positioned around one of said smaller diameter sections in a manner in which said large diameter section must be passed through said split ring in order to remove said fastener.

27) A method according to claim 26, wherein

said large diameter section is threaded.

28) A method for joining a first body to a second body, said method comprising

providing a fastener comprising an elongated shaft of varying diameter along a longitudinal axis;

providing a resilient member adapted to be selectively positioned around said fastener and sized such that said resilient member is in an un-stressed state at various positions along said longitudinal axis, and said resilient member is in a stressed state in at least one position along said longitudinal axis;

positioning said resilient member in said second body;

positioning a first portion of said shaft through said second body and into said first body;

positioning said resilient member around said fastener in a position adjacent to said at least one position in which said resilient member is in a flexed state such that said shaft is retained with respect to said second body.

29) A method according to claim 28, wherein

said first body is bone and said second body is a surgically implantable device.

30) A method according to claim 28, wherein

said resilient member is a split-ring spring that surrounds said shaft.

31) A method of fastening a surgically implantable device to a bone, said method comprising

providing a bone screw that has a head having a proximal end of a first diameter, a middle portion of a second diameter, and a distal end of a third diameter, said second diameter being greater than said first and third diameters; and that has a shaft extending from the distal end of said head and being adapted to be fixedly retained in said bone;

providing a resilient retention member adapted to fit around said head in a manner in which said retention member is flexed when positioned around said second diameter, but said retention member is un-flexed when positioned around said third diameter;

positioning said retention member into a receiving opening in said surgically implantable device that is sized to prevent removal of said head and said retention member from therein when said retention member is positioned around said first diameter;

positioning said bone screw through said implantable device and through said retention member; and

installing said bone screw into said bone.

32) A method according to claim 31, wherein

said middle portion is threaded.

33) A plate system for orthopedic use, said system comprising

a generally flat plate having a top surface, a bottom surface, and at least one hole;

a ring-shaped sleeve received in said hole and having internal threads;

a fastener adapted to be positioned through said hole and sleeve, and driven into a vertebra, said fastener having a head portion with external threads adapted to mate with said internal threads; and

a sleeve cover adapted to be attached to said flat plate top surface so that it overlaps said sleeve and prevents said sleeve from being removed from said plate in a direction moving away from the top surface of said plate.

34) A plate system according to claim 33, wherein

said sleeve cover comprises a generally flat member having a screw-hole adapted to receive a screw therein for tightening said sleeve cover to said plate.

35) A plate system according to claim 33, wherein

said hole is elongated.

36) A plate system according to claim 35, further comprising

a crescent-shaped spacer adapted to be received in said hole in order to occupy space within the hole adjacent to said sleeve when said sleeve is positioned in said hole.

37) A plate system according to claim 35, further comprising

an oval-shaped spacer having an opening therein and being adapted to be received in said hole in order to occupy space within the hole when said sleeve is positioned in said opening.

38) A plate system for orthopedic use, said system comprising

a generally flat plate having a top surface, a bottom surface, and at least one hole;

a ring-shaped sleeve received in said hole and having at least one internal ridge;

a fastener adapted to be positioned through said hole and sleeve, and driven into a vertebra;

a ring locking member adapted to lock said fastener head relative to said internal ridge; and

a sleeve cover adapted to be attached to said flat plate top surface so that it overlaps said sleeve and prevents said sleeve from being removed from said plate in a direction moving away from the top surface of said plate.

39) A plate system according to claim 38, wherein

said sleeve cover comprises a generally flat member having a screw-hole adapted to receive a screw therein for tightening said sleeve cover to said plate.

40) A plate system according to claim 38, wherein

said hole is elongated.

41) A plate system according to claim 38, further comprising

a crescent-shaped spacer adapted to be received in said hole in order to occupy space within the hole adjacent to said sleeve when said sleeve is positioned in said hole.

42) A plate system according to claim 41, further comprising

an oval-shaped spacer having an opening therein and being adapted to be received in said hole in order to occupy space within the hole when said sleeve is positioned in said opening.

43) A surgically implantable system adapted to fasten to a bone, said system comprising

an implant device having at least one hole therethrough, said hole having a surface diameter at an upper surface, an intermediate diameter greater than said surface diameter, a section of varying diameter between said surface diameter and said intermediate diameter, and a lower surface positioned between said bone and said upper surface;

a fastener positioned in said hole and having a head with a proximal end of a first diameter, a middle portion of a second diameter, and a distal end of a third diameter, said second diameter being greater than said first and third diameters;

a shaft extending through said hole from the distal end of said head and being adapted to be fixedly retained in said bone; and

a retention member adapted to fit around said head in a manner in which said retention member is positioned between said surface diameter and said intermediate diameter.

44) A system according to claim 43, wherein

said retention member is between and makes contact with said fastener head and said section of varying diameter in order to lock said fastener relative to said implant device.

45) A system according to claim 43, wherein

said retention member is resiliently expanded when positioned around said fastener head.

46) A system according to claim 44, wherein

said fastener head is adapted to be locked relative to said implant device in any one of a variety of relative angular orientations.

47) A system according to claim 44, wherein

said fastener head is hemispherical.

48) A system according to claim 43, wherein

said retention member is ring-shaped.

49) A system according to claim 43, wherein

said retention member is a split-ring.

50) A system according to claim 48, wherein

said retention member has an inner surface that varies in diameter in an axial direction.

51) A system according to claim 48, wherein

said retention member has an outer surface that varies in diameter in an axial direction.

52) A system according to claim 49, wherein

said retention member has an inner surface that varies in diameter in an axial direction.

53) A system according to claim 49, wherein

said retention member has an outer surface that varies in diameter in an axial direction.

54) A system according to claim 48, wherein

said retention member has an inner diameter that increases along an axial direction from top to bottom.

55) A system according to claim 48, wherein

said retention member has an outer diameter that increases along an axial direction from top to bottom.

56) A system according to claim 49, wherein

said retention member has an inner diameter that increases along an axial direction from top to bottom.

57) A system according to claim 49, wherein

said retention member has an outer diameter that increases along an axial direction from top to bottom.